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County of San Benito
California

CIRCULATION
CONSERVATION
and
NOISE ELEMENTS
of
The General Plan
1973

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UNIVERSITY OF CALIFORNIA

Prepared by

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San Jose, California

THE GENERAL PLAN

COUNTY OF SAN BENITO, CALIFORNIA

NOISE ELEMENT

1973

I wonder about the trees:
Why do we wish to hear
Forever the noise of these
More than another noise
So close to our dwelling place?

Robert Frost
The Sound of Trees
1916

TABLE OF CONTENTS

	Page
Purpose	1
Legal Basis	1
Fundamentals of Sound	3
Types of Sound Waves	4
Range of Sound	5
The Decibel	6
Figure 1 - Doubling the number of identical sources results in a 3dB increase in sound pressure level...facing	6
Sound Frequency	7
Sound Measurement	7
Figure 2 - Block diagram indicating the typical internal arrangement of a sound level meter...facing	7
The Decibel Scale	8
Table 1 - The Decibel Scale	8
Noise	9
Effect of Noise	10
Noise Control	11
Table 2 - Maximum Recommended Occupational Noise Exposure	12
Table 3 - Maximum Suggested Non-occupational Exposure	14
Communication Interference	14
Figure 3 - Noise Level Nomograph...facing	15
Major Noise Sources	15
Highways and Freeways	16
State Highways	16
Typical Truck Noise Chart and Noise Levels for State Highways, San Benito County - Maps 5, 6, 7, 8, 9 and 10...following	17
Airport Noise	18
Jet Aircraft	19
Figure 4 - One-third Octave Band Levels for Executive Jet Aircraft...facing	19
Hollister Airport	20
Figure 5 - Noise Exposure Forecast Contours for 1975.facing	20
Figure 6 - Noise Exposure Forecast Contours for 1990.facing	21
FMC Corporation - Defense Technology Laboratories	21
Figure 7 - Noise Contours FMC Explosive Test Site...facing	22
Conclusion	24

Purpose. The increasing invasion of the environment by noise producing sources has as its cause, among other things, the population explosion and the technology to cope with it.

Everywhere noisy machines are at work -- in the street where jackhammers are ripping up the pavement to bury television cable; in the field where diesel tractors are going about the tasks essential to the agricultural economy; on the highways busy with huge trucks which are the lifeblood of the transportation system; in the sky where sleek airliners are whisking passengers back and forth across the continent in half a day's time; and in the home where the vacuum cleaner, dishwasher, laundry machines, garbage disposal, television, the teenager's hifi and her brother's power scooter -- all combine to fill our daily lives with a loud cacophony of sound.

The increasing awareness of the effect of noise on our health and well being has prompted the California Legislature to require a Noise Element as a part of the General Planning process. Their mandate is found in Section 65302 of the Government Code of California.

Legal Basis. Section 65302 of the Government Code of California reads in part as follows:

> "65302. The General Plan shall consist of a statement of development policies and shall include diagram or diagrams and text setting forth objectives, principles, standards, and plan proposals. The plan shall include the following elements:....(g) A noise element in quantitative, numerical terms, showing contours of present and projected noise levels associated with all existing

and proposed major transportation elements. These include but are not limited to the following:

(1) Highways and freeways

(2) Ground rapid transit systems

(3) Ground facilities associated with all airports operating under a permit from the State Department of Aeronautics.

"These noise contours may be expressed in any standard acoustical scale which includes both the magnitude of noise and frequency of its occurrence. The recommended scale is sound level A, as measured with A-weighting network of a standard sound level meter, with corrections added for the time duration per event and the total number of events per 24-hour period.

"Noise contours shall be shown in minimum increments of five decibels and shall be continued down to 65 db(a). For regions involving hospitals, rest homes, long-term medical or mental care, or outdoor recreational areas, the contours shall be continued down to 45 db(a).

"Conclusions regarding appropriate site or route selection alternatives or noise impact upon compatible land uses shall be included in the general plan.

"The state, local, or private agency responsible for the construction or maintenance of such transportation facilities shall provide to the local agency producing the general plan, a statement of the present and projected noise levels of the facility, and any information which was used in the development of such levels."

(1)

Fundamentals of Sound. Noise is sound and sound is sometimes defined as that form of vibrational energy that gives rise to the sensation of hearing. While this definition is acceptable, it is of limited usefulness in understanding how sound is generated, propagated, and perceived.

The most common physical mechanism for generating sound is the mechanical vibration of solid surfaces. Such surfaces can be excited into vibration by numerous mechanisms, such as transient or periodic impacts or oscillatory motions of equipment.

Consider what happens when the sheetmetal panels of a truck hood are set into vibration due to engine operation within the enclosure. The vibrating panel moves alternately back and forth. As it moves forward, it pushes against the air nearest it. When the panel reverses its direction of motion, it produces a partial vacuum, or rarefaction, in the nearby air. The alternate compression and expansion of the air adjacent to the panels results in small local fluctuations in the atmospheric pressure. These fluctuations in turn cause a portion of the air farther away from the panel also to fluctuate in pressure.

This local disturbance is thus propagated through the air in the form of sound waves that reach our ears. In addition to being generated by the mechanical vibration of solid surfaces, audible sound is frequently generated by the flow of gases, e.g., by compressed air exhausting

(1) Fundamentals of Noise: Measurement, Rating Schemes, and Standards; The National Bureau of Standards, Interagency Agreement with the U. S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C., December 31, 1971.

from a pneumatic hammer or by the turbulent jet exhaust of an aircraft.

Types of Sound Waves. Sound waves are members of a general class known as elastic waves, characterized by the fact that a disturbance initiated at one point is transmitted to other points in a predictable manner determined by the physical properties of the medium in which the wave is propagated. Sound waves can occur in many media. We are familiar with sounds that occur in air; however, sound also is transmitted in water, structures and virtually any solid, liquid or gas.

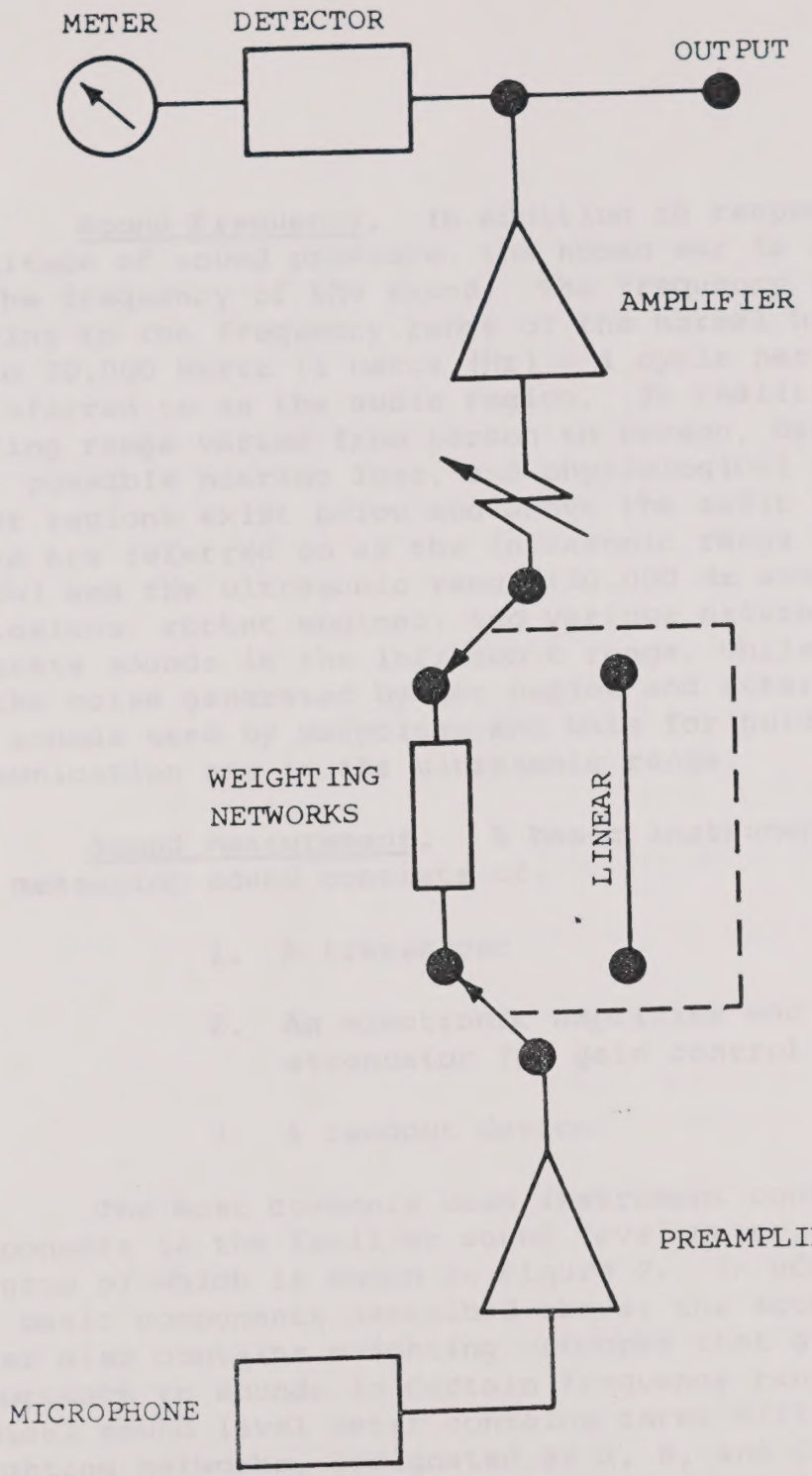
For discussing sound waves in air, it is helpful to think about two types of waves -- the plane wave and the spherical wave. If sound propagates in one direction only, the forward edge of the wave lies on the surface of a plane perpendicular to the direction of propagation of the wave. Measurement of the pressure fluctuations associated with a plane, or free, progressive wave is simplified because the location of the transducer is unimportant. A transducer is a device which translates the changing magnitude of one kind of quantity, e.g., sound pressure on a microphone, into corresponding changes in another kind of quantity, e.g., voltage.

The sound pressure is the same everywhere in space, except for relatively small effects due to absorptive and dissipative losses in the medium. An approximation to this simple kind of wave is obtained far away from a sound source when the source is placed in an acoustically free field (a field without any nearby sound reflecting obstacles).

Another type of sound wave frequently encountered in practice is the spherical wave. Such waves can be thought of as waves propagating away from a small point source with an absence of reflecting surfaces in the vicinity of the source and the point of measurement. An instantaneous picture of the pressure distribution in the forward edge of the pressure wave would show that it lies on the surface of a sphere, with the center of the sphere located at the point source.

Unlike the case of plane waves, the acoustical intensity (sound power per unit area) of spherical waves decreases as the wave gets farther from the source, according to a relationship known as the inverse square law. In an ideal free field, and with no dissipation, a 6-decibel (dB) decrease in sound pressure level (a level implies relative quantities; this concept will be discussed later) could be expected for each doubling of distance. Since real conditions are not ideal, in practice some loss other than 6 dB per double-distance can be expected.

Range of Sound. The range of sound pressures between the threshold of hearing (for normal young people the smallest sound pressure the human ear can sense) and the highest sound pressure to which people are exposed (the lift-off noise near a Saturn rocket) covers a range of 1,000,000,000 to 1. Since there is interest in observing the effects of small changes at both extremes, a linear scale would be impractical. A simple mathematical scale suited to this range of numbers is a scale based on the logarithm (to the base ten) of the relative sound pressures.



Block diagram indicating the typical internal arrangement of a sound level meter.

Figure 2

Sound Frequency. In addition to responding to the magnitude of sound pressure, the human ear is sensitive to the frequency of the sound. The frequency region corresponding to the frequency range of the normal human ear -- 20 to 20,000 Hertz (1 Hertz (Hz) = 1 cycle per second) -- is referred to as the audio region. In reality, the human hearing range varies from person to person, depending on age, possible hearing loss, and physiological conditions. Other regions exist below and above the audio region. These are referred to as the infrasonic range (20 Hz and below) and the ultrasonic range (20,000 Hz and above). Explosions, rocket engines, and various natural phenomena generate sounds in the infrasonic range, while a portion of the noise generated by jet engine and rotary machinery and sounds used by porpoises and bats for guidance and communication are in the ultrasonic range.

Sound Measurement. A basic instrumentation system for measuring sound consists of:

1. A transducer
2. An electronic amplifier and calibrated attenuator for gain control
3. A readout device

The most commonly used instrument containing these components is the familiar sound level meter, a block diagram of which is shown in Figure 2. In addition to the basic components described above, the sound level meter also contains weighting networks that give greater importance to sounds in certain frequency ranges. A typical sound level meter contains three different response weighting networks, designated as A, B, and C. Recently a new weighting curve -- the D curve -- has been proposed for measuring jet aircraft noise.

The most commonly used sound level meter utilizes the A-weighting network. The A-weighted sound level is emerging as the measure most often utilized in objective and subjective studies of noise.

The Decibel Scale. In order to translate this somewhat technical information into a more understandable form Table 1 has been prepared which shows the relationship between the decibel scale and a sound which is typical of that intensity.

TABLE 1

THE DECIBEL SCALE

dBA	Nature of Sound
0	Threshold of Hearing
10	Normal Breathing
20	Leaves rustling in a breeze
30	Empty movie house - Electric refrigerator
40	Residential Neighborhood at night
50	Quiet restaurant
60	Two-person conversation
70	Busy traffic
80	Vacuum cleaner - Electric dishwasher

TABLE 1

THE DECIBEL SCALE
(cont'd)

dBA	Nature of Sound
90	Water at foot of Niagara Falls
100	Subway train - garbage disposal
120	Propeller plane at take off
130	Machine gun fire, close range
140	Military jet at take off

Noise. What is noise? It is, quite simply, an unwanted sound. How do we rid ourselves of an unwanted sound? This is not a simple matter because individuals differ as to what sounds they like and which they dislike. A symphony goer might find rock and roll music exceedingly distasteful and vice-versa.

Probably the kind of noise most irritating to the largest number of people is that which interferes with conversation. A passenger engrossed in reading a newspaper on a subway train is unconscious of the roar beating upon his eardrums. But two people who want to carry on a conversation would be highly conscious of the noise and irritated by it.

Someone has said that noise is a random pattern of sound which keeps the listener in a state of constant distraction and suspense -- waiting, as it were, for the other shoe to drop. Sounds that are completely meaningless

to the listener may be irritating. Some technical dictionaries still define noise in these terms alone "a class of sounds which do not exhibit clearly defined frequency components." Taken collectively, the trills and toots of an orchestra tuning up illustrate this definition. Each player is independently testing his own instrument; there is no overall relationship among the tones being played nor can any dominant pattern of frequency be distinguished.

A sound that does not have a stable and well defined pattern of frequency or rhythm, and persists for more than a short period of time, is disturbing to most people because of its apparent senselessness.(2)

Effect of Noise. An important physiological effect of excessive noise, and therefore the basis for an important noise criterion, is permanent hearing handicap. This might occur after a person has been exposed to loud sounds on a recurrent daily basis over a long period of time. Occupational deafness represents this type of problem, as noted in surveys of workers in heavy industry.

The measurement of hearing loss of a person is accomplished by measurement of the lowest (weakest) sound pressure level, called the threshold, that the individual can hear. This is done with an audiometer, which is an electroacoustical instrument consisting of an electronic oscillator, attenuator, and earphone for producing sound pressure levels in the ear of the subject at various frequencies. The amount, expressed in decibels, by which a person's measured threshold of audibility exceeds the standard (normal) audiometric threshold is his hearing threshold level.

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(2) Adapted from Sound and Hearing, S. S. Stevens, Fred Warshofsky and the Editors of Life Magazine, Life Science Library, p 170 et seq.

Hearing measurements made with audiometers are thus expressed as hearing threshold levels (in dB) at various pure-tone frequencies (in Hz). A person is recognized as having a slight hearing impairment for speech sounds whenever the average of his hearing threshold levels at 500, 1000 and 2000 Hz lies between 25 and 40 dB.

Noise Control. Current guidelines for occupational noise exposure control are primarily aimed at protecting hearing in a restricted range of frequencies, typically 500 to 2,000 Hz, which is critical to the understanding of speech. On this basis hearing handicap is defined as: the condition wherein the average hearing threshold levels at 500, 1000 and 2000 Hz exceed 25 dB. These guidelines, with which present Federal regulations are consistent, are intended to protect 80 to 90 percent of the exposed worker populace from noise-induced hearing handicap, as defined above. Empirical data have been used as the basis for establishing guidelines for group exposure to continuous noise. The recommendations for limits on intermittent, or interrupted, exposure are based mainly on studies of temporary threshold shift resulting from various types of noise exposure.

TABLE 2

Maximum Recommended Occupational Noise Exposure

The values in parentheses are not explicitly given in the guidelines (1) being discussed but are consistent therewith and are given explicitly in present Federal regulations (2).

Sound Level dBA	Daily Exposure Time hr
90	8
(92)	(6)
95	4
(97)	(3)
100	2
(102)	(1-1/2)
105	1
110	1/2
115	1/4 or less

This table is based upon: (1) data which indicate that an 8 hour per day continuous exposure to levels below 90 dBA, over a period of many years, will not produce a noise-induced hearing handicap, as defined above, in 80 to 90 percent of the exposed population, and (2) data, mainly from studies based on temporary threshold shifts, which indicate that for each halving of the time of noise exposure per day the noise level may be increased by 5 dB without increasing the hazard of hearing impairment.

These guidelines specify that when the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each.

The permissible limits (guidelines) given in Table 2 are primarily concerned with occupational noise exposure. Such limits are typically keyed to a maximal eight-hour exposure day and, further, assume quiet conditions to exist outside of the usual eight-hour work period to permit auditory recovery. Occupational noise exposure limits are primarily aimed at protecting most, but not all, of the worker population from suffering a hearing impairment resulting in a handicap for understanding speech. The protection provided by such limits may be viewed as acceptable in an industrial setting since the worker can be financially compensated for any hearing damage incurred. However, in off-job situations it would appear justifiable to strive to protect all persons from any measurable loss of hearing due to noise exposure. This would include protection of hearing at higher frequencies which are very important, for example, to the appreciation of music.

A recent paper[3] by Cohen, Anticaglia, and Jones of the National Noise Study, U. S. Department of Health, Education, and Welfare, suggests the noise limits given in Table 3 for non-occupational noise exposure. These were set 15 decibels below the occupational limits (Table 2)

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(3) Cohen, A., Anticaglia, J., and Jones, H.H., "Sociocusis"--hearing loss from non-occupational noise exposure, Sound and Vibration 4 (11), 12-20 (November 1970).

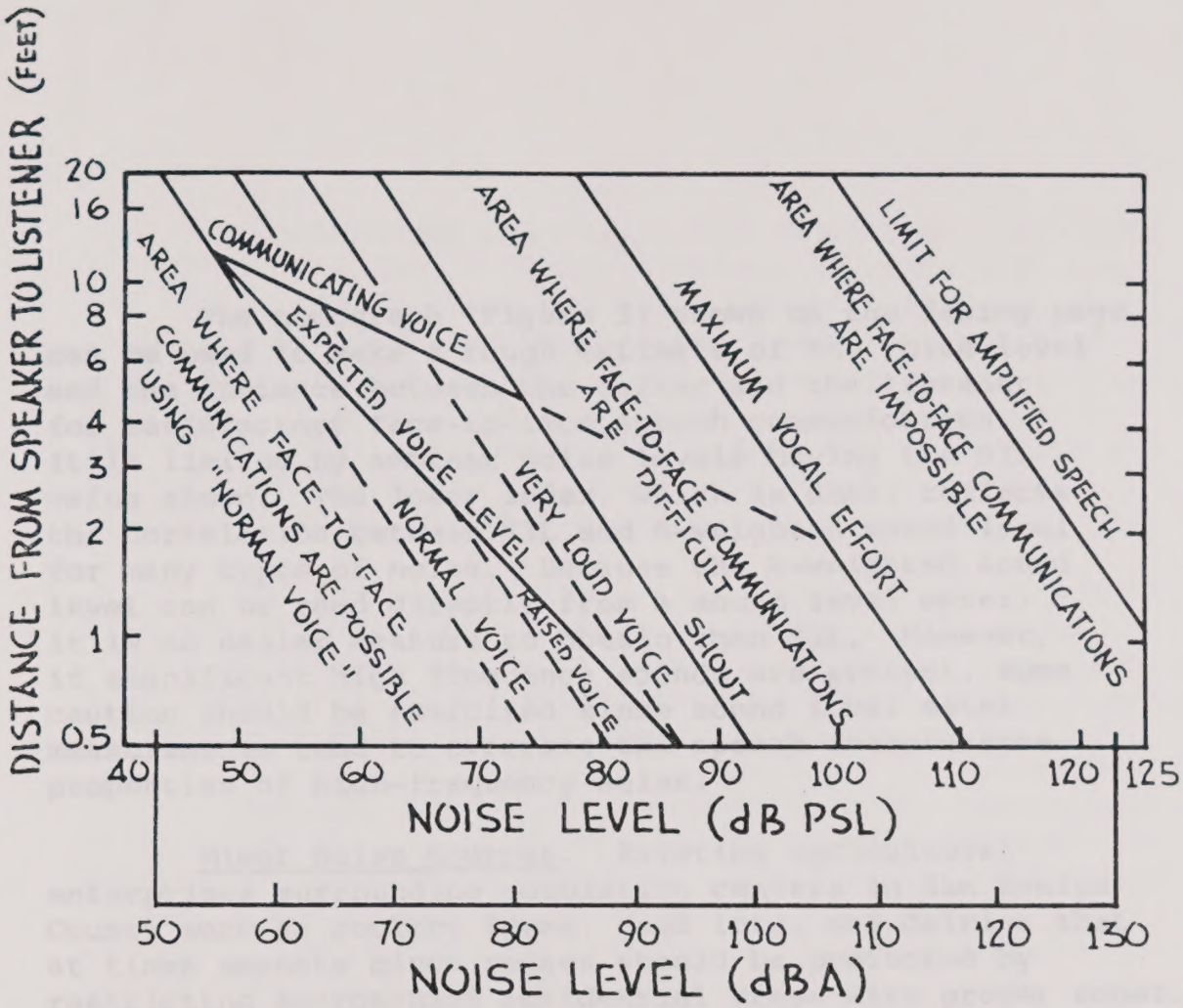
in order to provide protection of essentially all persons at all audiometric frequencies. These suggested limits appear reasonable but there is a need for supportive data regarding both continuous and intermittent noise.

TABLE 3

Maximum Suggested Non-Occupational Exposure

Sound Level dBA	Daily Exposure Time
70	16-24 hour
75	8
80	4
85	2
90	1
95	30 minutes
100	15
105	8
110	4
115	2

Communication Interference. One of the most directly observable effects of noise is its interference with communication. As a result of recent research a national standard called the Speech Interference Level (SIL) is being proposed. It is a simple numerical method for estimating the speech-interfering aspects of noise based on physical measurements of the noise. SIL is defined simply as the arithmetic average of the sound pressure levels in the three octave bands centered on the frequencies 500, 1000, and 2000 Hz, respectively.



Voice level and distance between talker and listener for satisfactory face-to-face speech communication. An example for interpreting this chart: Jet aircraft cabin noise is roughly 80± 2 dBA. At 80 dBA in their expected (raised) voice level, seat mates can converse at 2 feet and, by moving a little, can lower their voices to normal level and converse at one foot. To ask the stewardess for an extra cup of coffee from the window seat (4 feet), one would need to use his very loud communicating voice.

Figure 3

The nomograph (Figure 3) shown on the facing page can be used to make a rough estimate of the voice level and the distance between the talker and the listener for satisfactory face-to-face speech communication. It is limited by ambient noise levels having the SIL value shown. The lower index, which is dBAs, reflects the correlation between SIL and A-weighted sound level for many types of noise. Because the A-weighted sound level can be read directly from a sound level meter, it is an easier measure to obtain than SIL. However, if significant high frequency sounds are present, some caution should be exercised since sound level meter measurements tend to overrate the speech-interference properties of high-frequency noise.

Minor Noise Sources. Existing agricultural enterprises surrounding population centers in San Benito County such as poultry farms, feed lots, and dairies that at times emanate minor noises should be protected by restricting encroaching residential areas with proper zones.

There are some minor noise sources such as those related to agriculture that are often more annoying than they are injurious to the human ear. Examples are wind machines used for frost protection and summer cooling, air carrier sprayers, airplanes used for crops, tractors, earth moving equipment, and pumps.

Major Noise Sources. The Legislature has specifically listed three noise sources for which "present and projected noise levels" must be included in the General Plan. These are "highways and freeways, ground rapid transit systems, and ground facilities associated with all airports operating under a permit from the State Department of Aeronautics." The second of these items is not applicable in San Benito County because it does not now have and there is not presently contemplated that there will be a ground rapid transit system developed in this century.

Highways and Freeways. The major transportation network in San Benito County consists of state highways and county roads. From a traffic volume standpoint the county road system represents only a minor percentage. Traffic noise generated on it is minor and highly intermittent. It appears at this point in time that, with a few exceptions, any possibility either now or in the foreseeable future of the noise level on the county system exceeding acceptable standards is remote.

The only exceptions are locations in which gravel pits are in full scale operation. Noise levels along the county highways serving the gravel pits should be ascertained, and zoning regulations established to require these operations to meet some reasonable standard.

State Highways. In November 1972 the Environmental Studies Section of the Materials Department, District 5, California Division of Highways, issued an official publication "Noise Levels for State Highways in San Benito County." The publication covers all of the present and future state highways planned for the county. The report consists of some brief text and the graphic material illustrative of it. The report is as follows:

> "This report covers the noise levels for all state highways in San Benito County for present and future conditions, as requested by Mr. Keith A. Carlen, Road Commissioner, San Benito County under Section 65302 of the Government Code:
>
> "In showing the noise contours on sheets 5 to 10 inclusive it is assumed that all state highways will have diesel truck traffic with noise levels as shown on sheet 3.

"Due to low traffic volumes and lower traffic speeds in this county noise levels shown are generally higher than existing conditions, however, these levels can be expected occasionally at all locations.

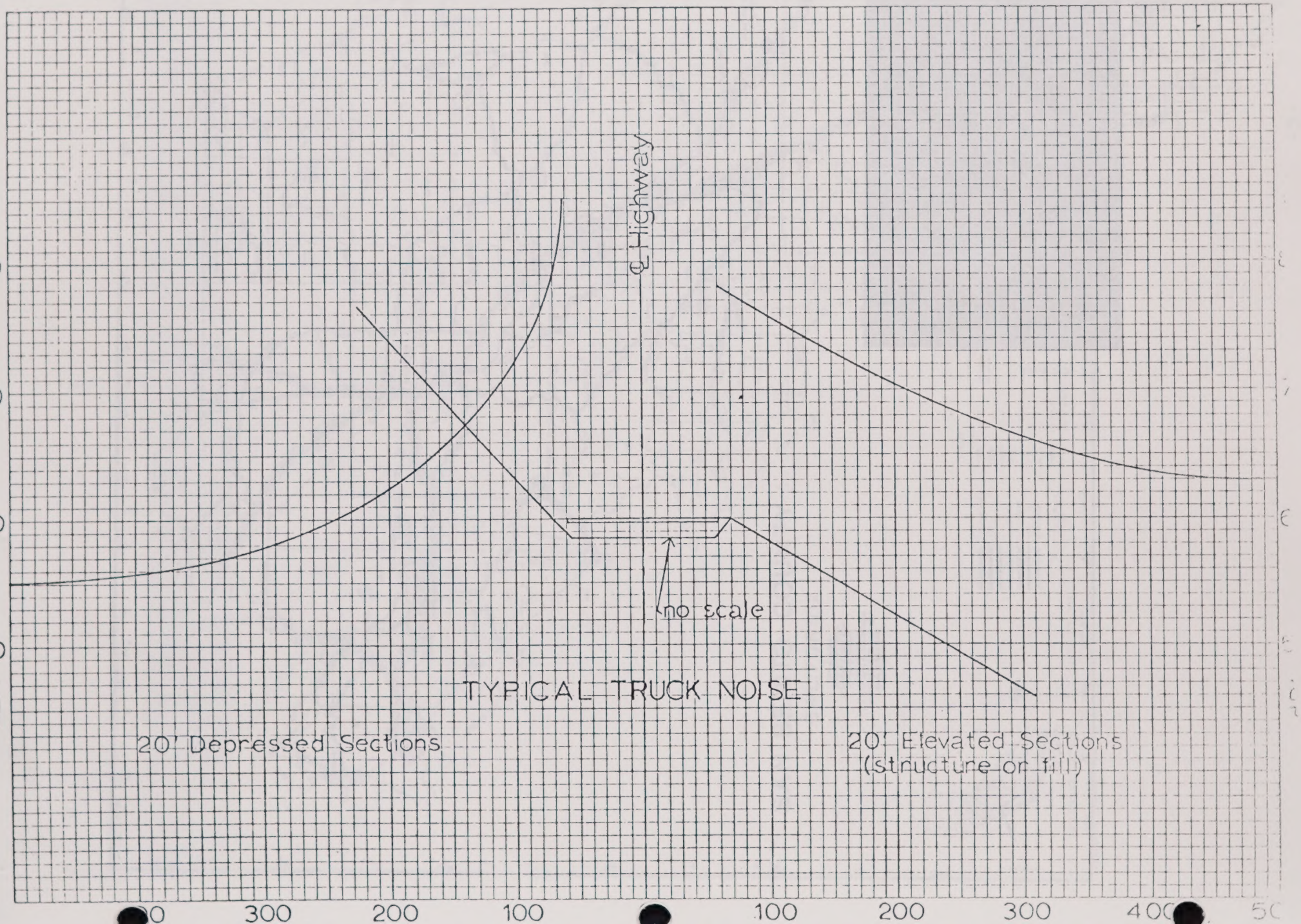
"These levels can be used as expected maximums for the present and the future. Also shown are presently adopted routes with contours shown for expected maximums in the future.

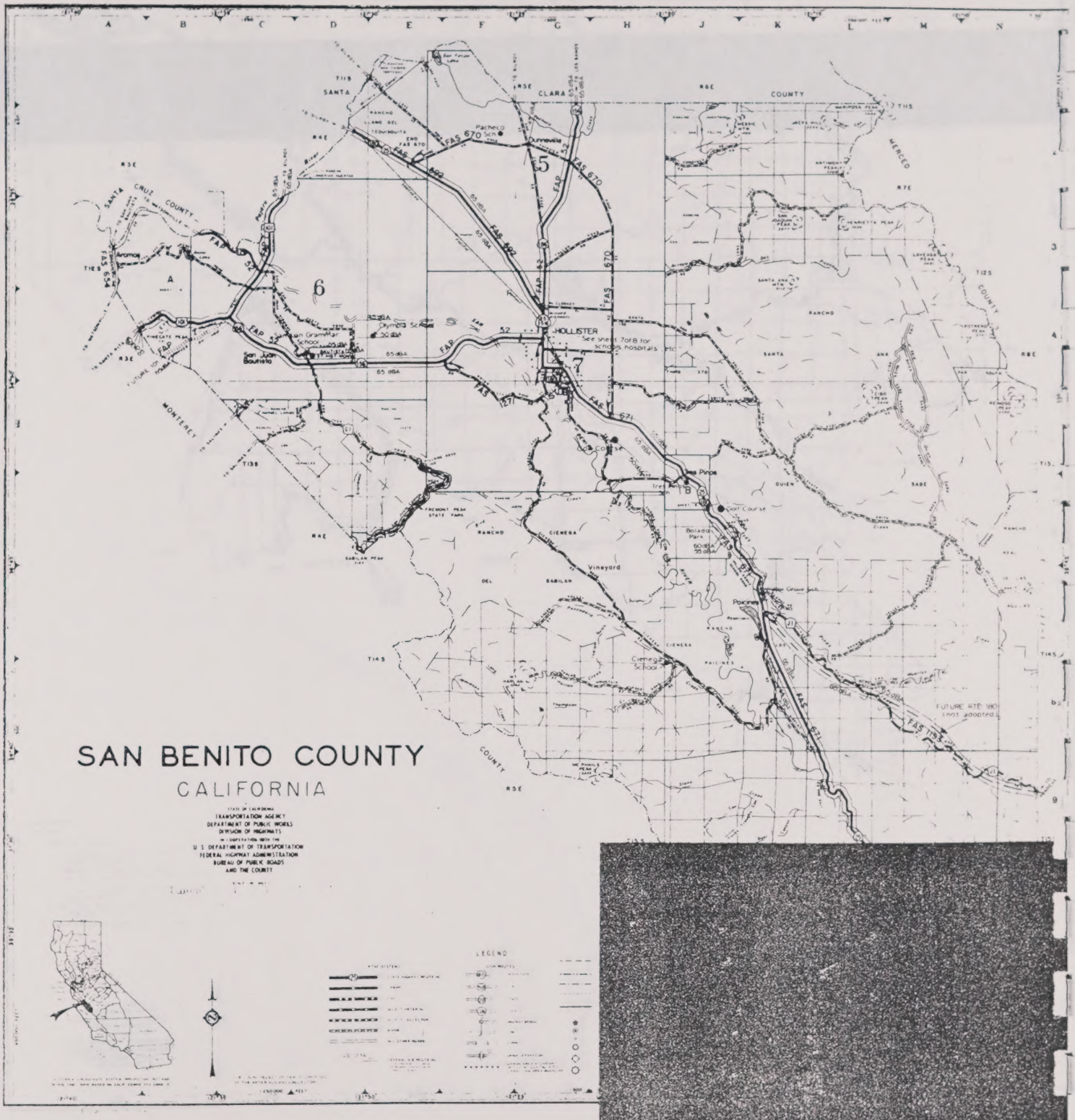
"These contours do not make any allowances for variations due to cut or embankment sections, buildings, barriers or other structures outside of the highway right of way. For variations in cuts or embankments see graph on sheet 4.

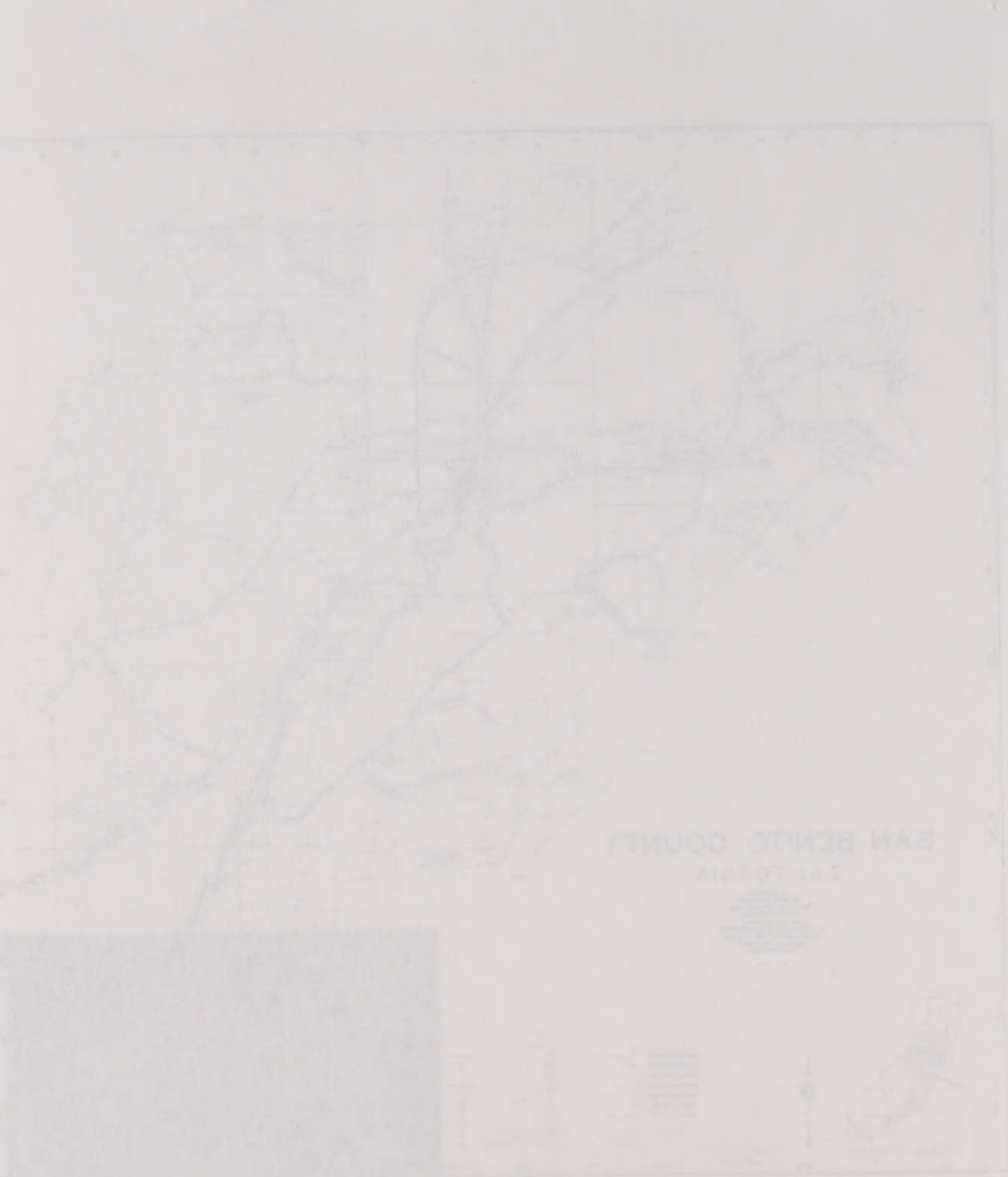
No variations are included due to local traffic noises or other noises generated by sources outside the state highway right of way.

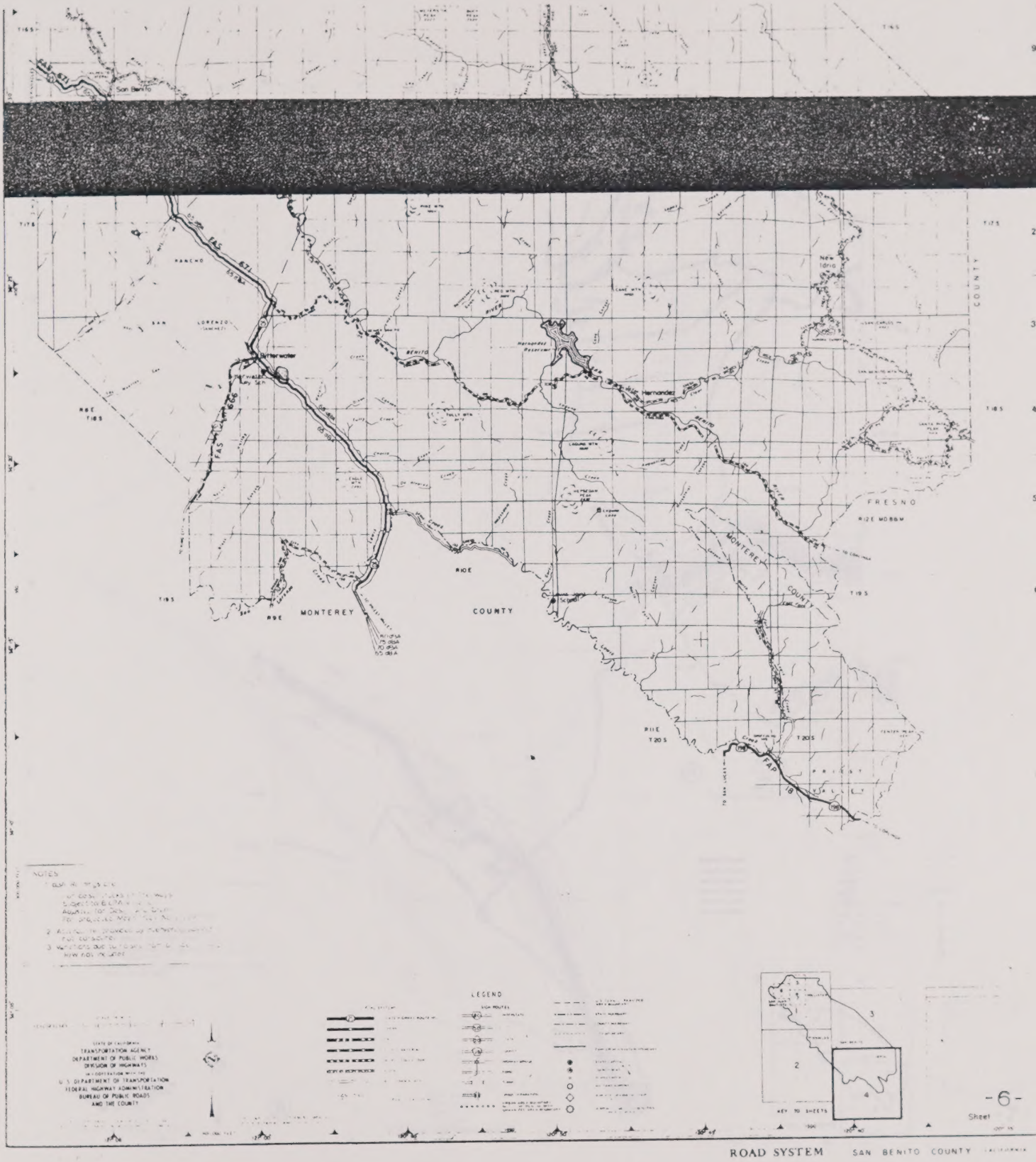
"Included in this report are noise contours for State Highway Routes 25, 101, 129, 156, 180 and presently adopted route changes on Routes 25 and 101."

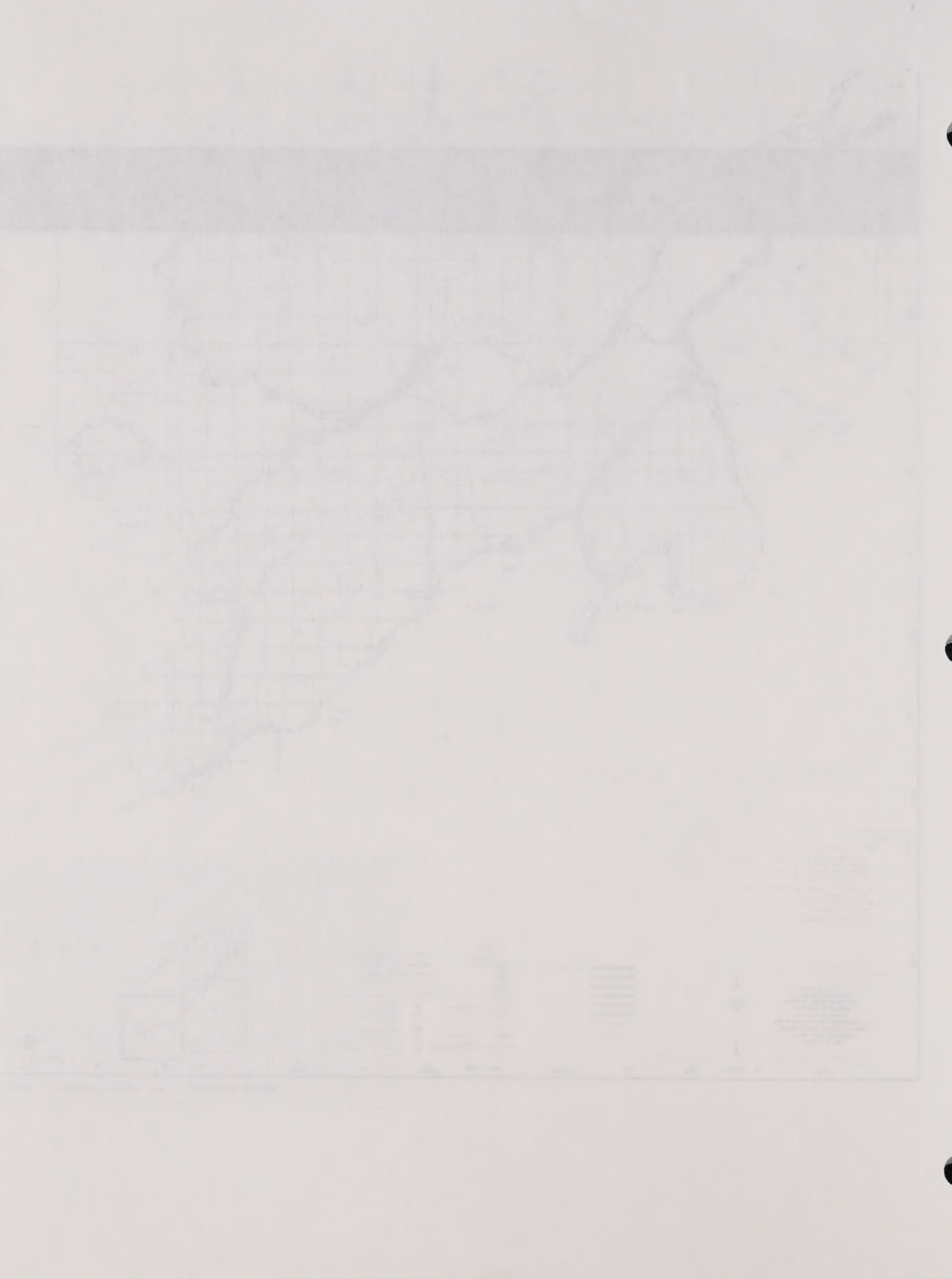
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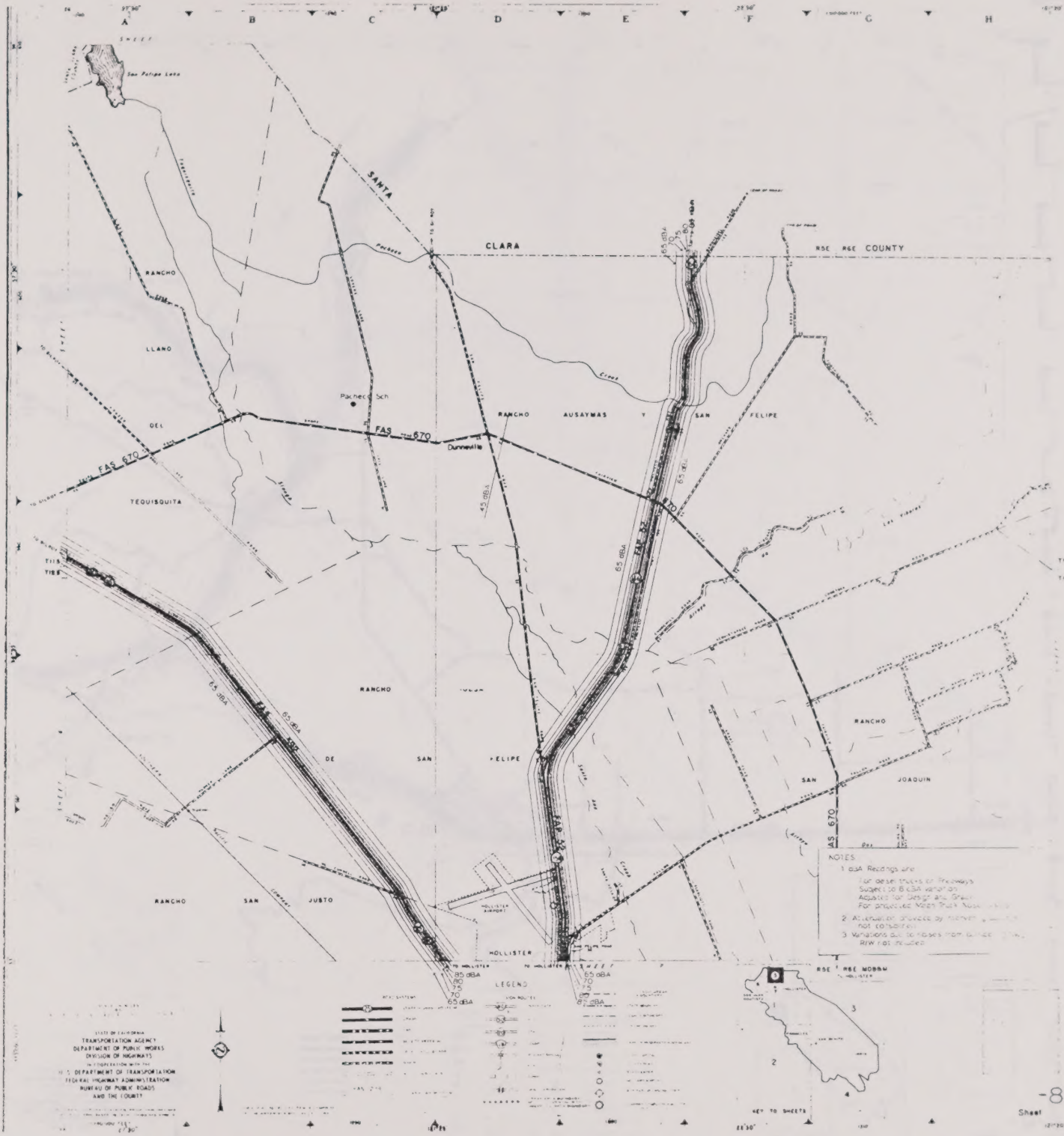

SAN BENITO COUNTY
CALIFORNIA
HOLLISTER
See sheet 7of8 for schools hospitals etc
Pacheco
Tumesia
San Juan Bautista
Vineyard
Paicines
Cienega School
Bolado Park
Pinnacles National Monument
FUTURE RTE 180 (not adopted)
LEGEND




San Benito
FAS 871
FAS 809
RANCHO
SAN LORENZO
Hernandez Reservoir
BENITO
COUNTY
FRESNO
MONTEREY
COUNTY
R5E
T18S
T19S
T20S
R11E
FAP 18
LEGEND
KEY TO SHEETS
Sheet
-6-
ROAD SYSTEM
SAN BENITO COUNTY



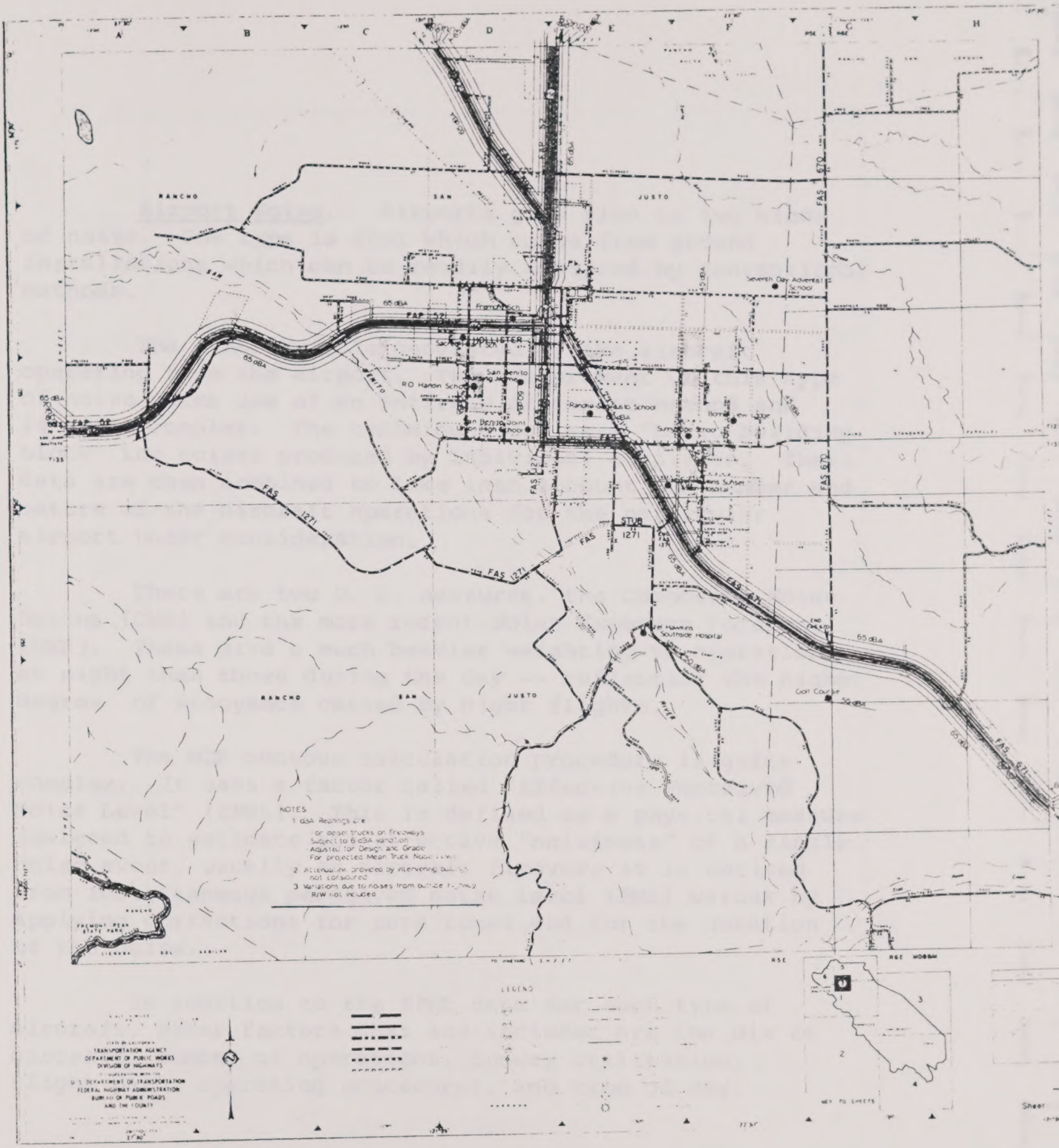

A B C D E F G H J
SANTA CRUZ COUNTY
RANCHO
Aromas
LAS AROMITAS
AGUA CALIENTE
MONTERREY COUNTY
FAS 634
AROMAS
T 12S, R3E
RANCHO
TRES PINOS
T 13S, R6E
LEGEND
NOTES
KEY TO SHEETS


A
B
C
D
E
F
G
H
SANTA
CLARA
COUNTY
RANCHO
LLANO
DEL
TEQUISQUITA
Pacheco Sch
Pacheco
Creek
RANCHO
AUSAYMAS
Y
SAN
FELIPE
Dunneville
FAS 670
FAS 156
65 dBA
RANCHO
DE
SAN
FELIPE
RANCHO
SAN
JOAQUIN
RANCHO
SAN
JUSTO
HOLLISTER
HOLLISTER AIRPORT
NOTES
1 dBA Readings are
2 Alignment of sources by
not consistent
3 Variations due to grades from
R/W not included
LEGEND
KEY TO SHEETS
Sheet
-8-




SANTA CRUZ CO.
SANTA CLARA COUNTY
RANCHO
LOMERIAS MUERTAS
SAN BENITO RIVER
ABRIGO
ABUA CALIENTE
MANUEL LAPIOS
San Juan Bautista
FUTURE RTE 101
FAP 52
65 dBA
MONTEREY COUNTY
LEGEND




RANCHO SAN JUSTO
Seventh Day Adventist School
Hollister
San Benito Joint Union High School
R.O. Hansen School
Rancho San Justo School
Sunnyslope School
Veterans Memorial Hospital
Mt. Hawkins Southside Hospital
Golf Course
STUR 1271
FAS 1271
FAS 670
FAP
65 dBA
50 dBA
NOTES
1 dBA Readings are
for diesel trucks on Freeways
Subject to 6 dBA Variation
Adjusted for Design 3% Grade
For projected Mean Truck Noise Levels
2 Attenuation provided by intervening buildings not considered
3 Variations due to noises from outside highway R/W not included
LEGEND
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
AND THE COUNTY



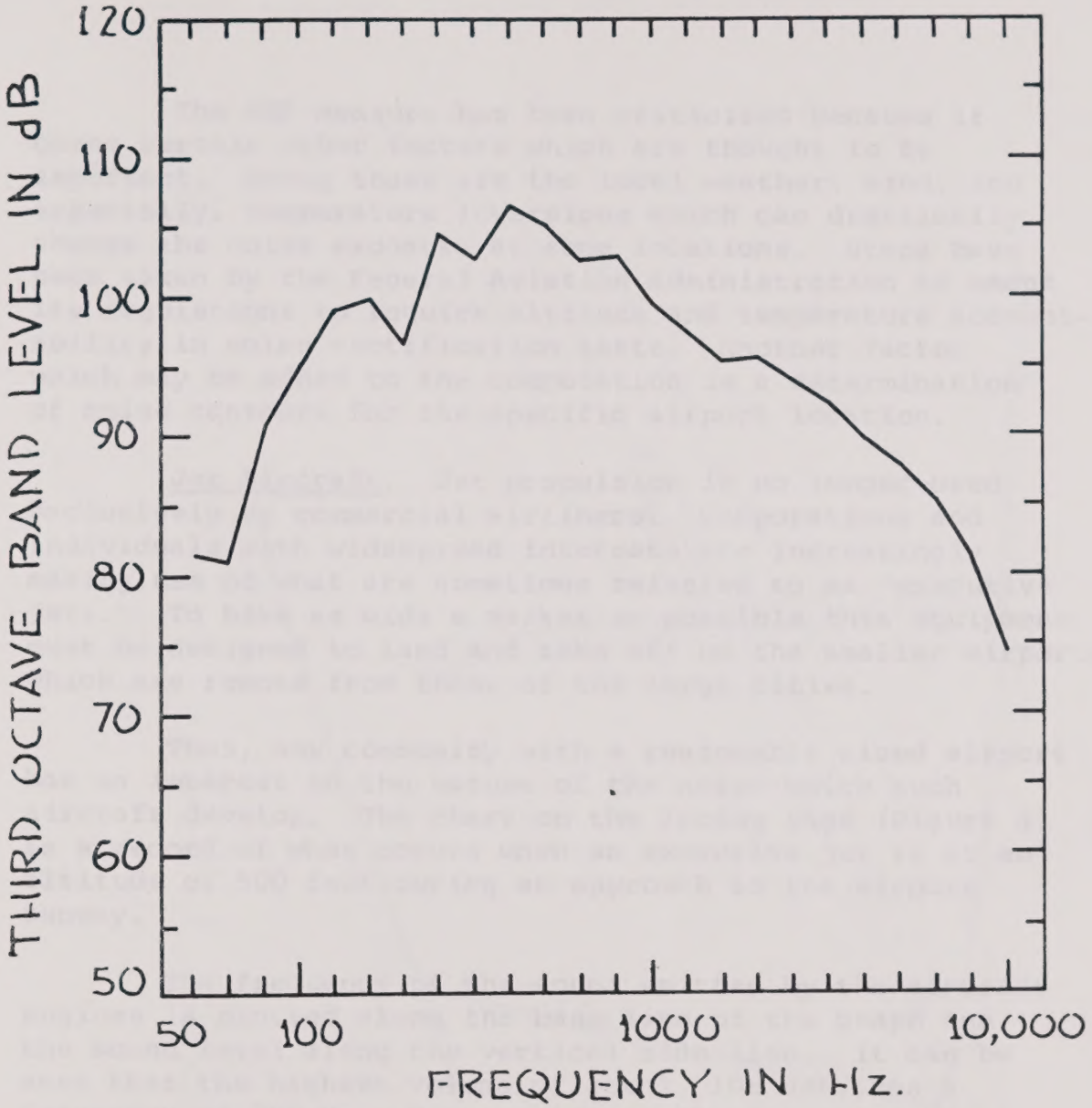
Airport Noise. Airports give rise to two kinds of noise. One type is that which comes from ground installations which can be readily measured by conventional methods.

The other type is generated by the aircraft operating from the airport. The measurement of this type of noise makes use of an entirely different method and is quite complex. The techniques use as a "basic building block" the noises produced by individual airplanes. These data are then combined to take into account the number and nature of the aircraft operations for the particular airport under consideration.

There are two U. S. measures, the Composite Noise Rating (CNR) and the more recent Noise Exposure Forecast (NEF). These give a much heavier weighting to operations at night than those during the day -- reflecting the higher degree of annoyance caused by night flights.

The NEF contour calculation procedure is quite complex. It uses a factor called "Effective Perceived Noise Level" (EPNL). This is defined as a physical measure designed to estimate the effective "noisiness" of a single noise event, usually an aircraft flyover; it is derived from instantaneous perceived noise level (PNL) values by applying corrections for pure tones and for the duration of the noise.

In addition to the EPNL data for each type of aircraft, other factors that are included are the mix of aircraft, number of operations, runway utilization, flight path, operating procedures, and time of day.



One-third octave band levels for an executive jet aircraft at an altitude of 500 feet during an approach operation.

Figure 4

The NEF measure has been criticized because it omits certain other factors which are thought to be important. Among these are the local weather, wind, and especially, temperature inversions which can drastically change the noise exposure at some locations. Steps have been taken by the Federal Aviation Administration to amend its regulations to require altitude and temperature accountability in noise certification tests. Another factor which may be added to the computation is a determination of noise contours for the specific airport location.

Jet Aircraft. Jet propulsion is no longer used exclusively by commercial airliners. Corporations and individuals with widespread interests are increasingly making use of what are sometimes referred to as "executive jets." To have as wide a market as possible this equipment must be designed to land and take off on the smaller airports which are remote from those of the large cities.

Thus, any community with a reasonable sized airport has an interest in the nature of the noise which such aircraft develop. The chart on the facing page (Figure 4) is a record of what occurs when an executive jet is at an altitude of 500 feet during an approach to the airport runway.

The frequency of the sound emitted by the aircraft engines is plotted along the base line of the graph and the sound level along the vertical side line. It can be seen that the highest volume of sound, 106 dBA, has a frequency of 700 Hz. For comparison the musical note "A" above middle C (the standard to which American instruments are tuned) is 448 Hz. Middle C itself is 261.6 Hz.

Noise exposure forecast contours for 1975

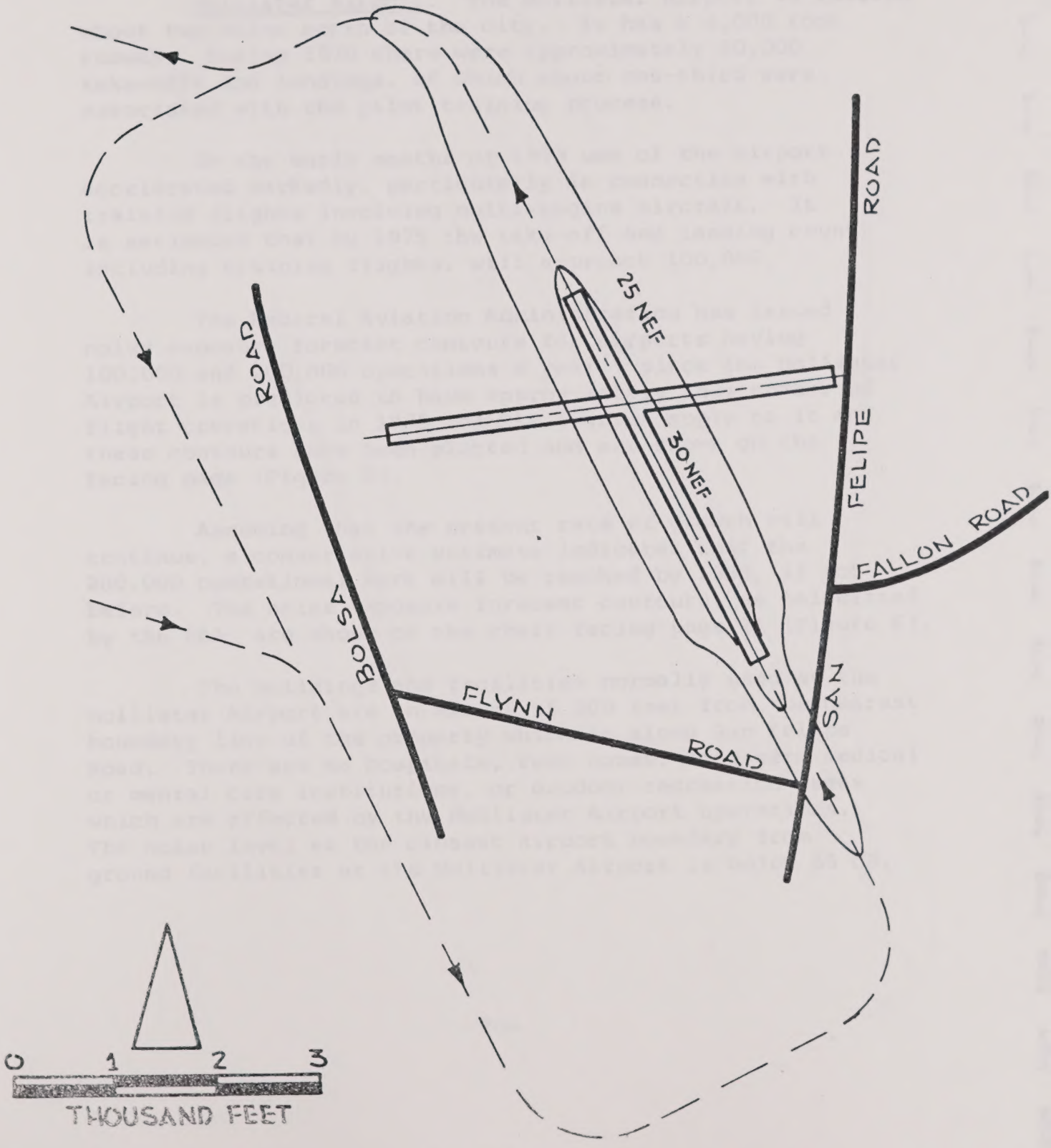
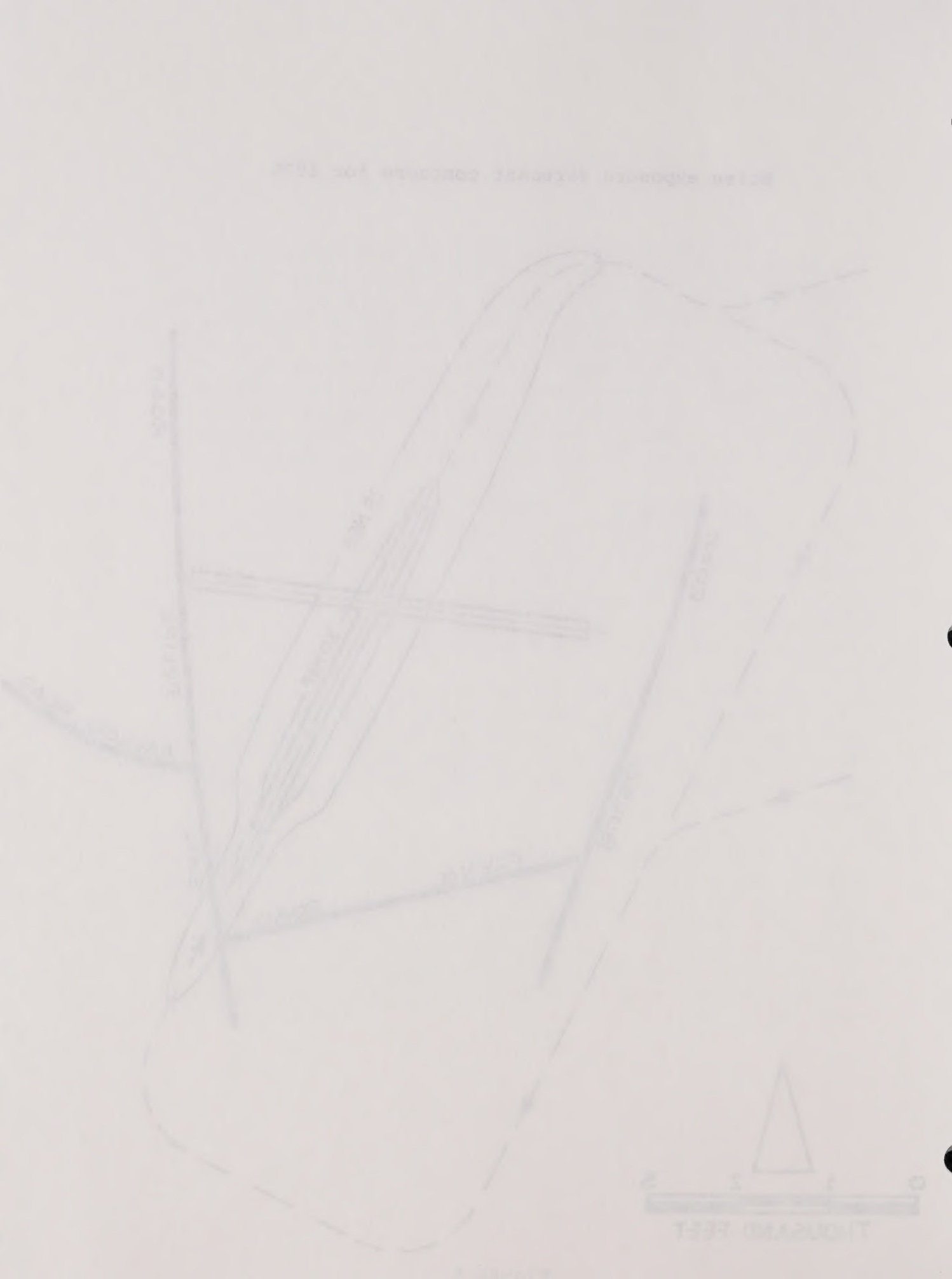


Figure 5



Hollister Airport. The Hollister Airport is located about two miles north of the city. It has a 4,000 foot runway. During 1970 there were approximately 60,000 take-offs and landings, of which about one-third were associated with the pilot training process.

In the early months of 1973 use of the airport accelerated markedly, particularly in connection with training flights involving multi-engine aircraft. It is estimated that by 1975 the take-off and landing count, including training flights, will approach 100,000.

The Federal Aviation Administration has issued noise exposure forecast contours for airports having 100,000 and 200,000 operations a year. Since the Hollister Airport is predicted to have approximately this number of flight operations in 1975 the FAA figures apply to it and these contours have been plotted and are shown on the facing page (Figure 5).

Assuming that the present rate of growth will continue, a conservative estimate indicates that the 200,000 operational mark will be reached by 1990, if not before. The noise exposure forecast contours, as calculated by the FAA, are shown on the chart facing page 21 (Figure 6).

The buildings and facilities normally used at the Hollister Airport are in excess of 500 feet from the nearest boundary line of the property which is along San Felipe Road. There are no hospitals, rest homes, long-term medical or mental care institutions, or outdoor recreation areas which are affected by the Hollister Airport operations. The noise level at the closest airport boundary from ground facilities at the Hollister Airport is below 65 dB,

Noise exposure forecast contours for 1990

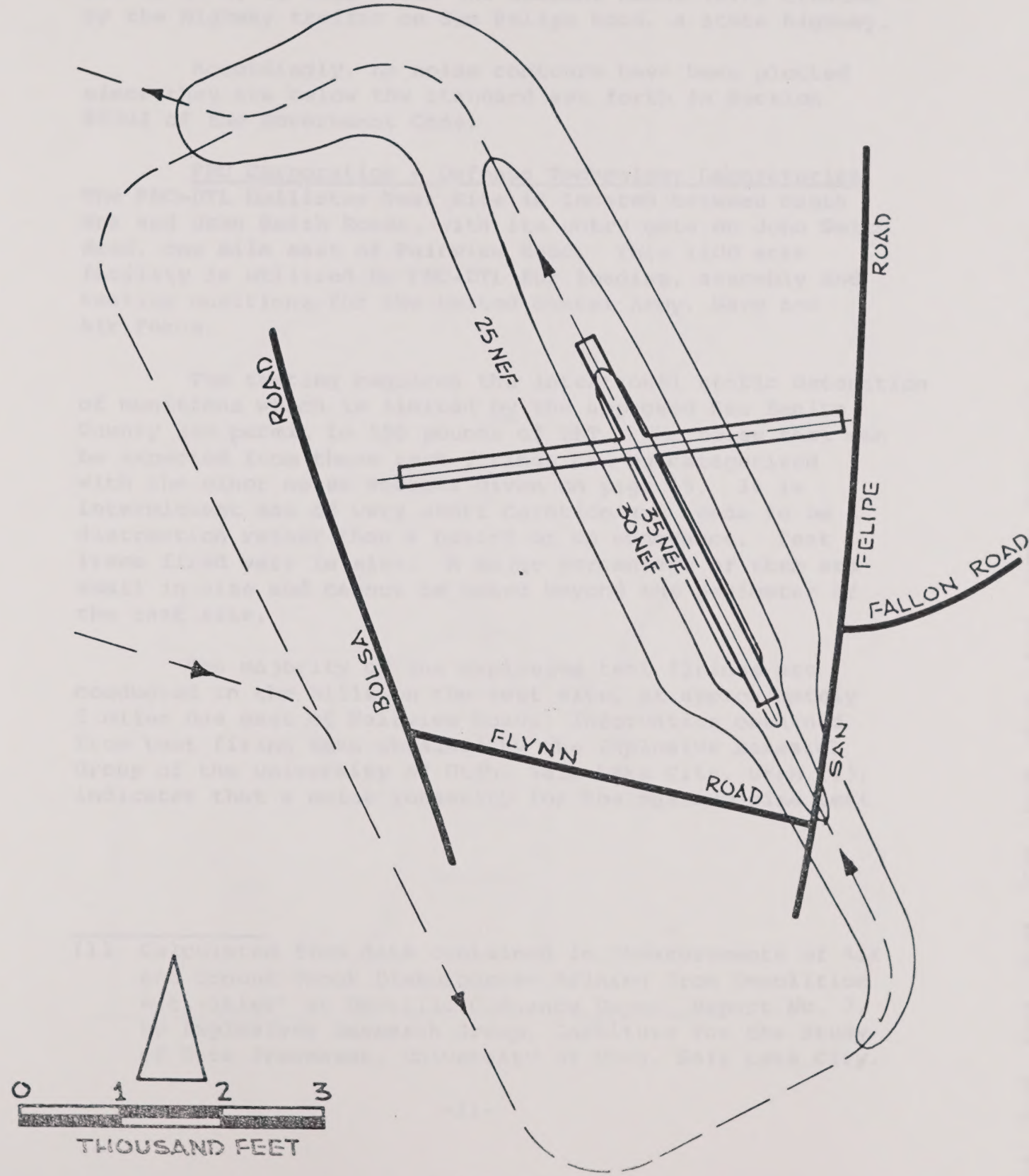


Figure 6

and in fact, is well below the ambient noise level created by the highway traffic on San Felipe Road, a state highway.

Accordingly, no noise contours have been plotted since they are below the standard set forth in Section 65302 of the Government Code.

FMC Corporation - Defense Technology Laboratories. The FMC-DTL Hollister Test Site is located between Santa Ana and John Smith Roads, with its entry gate on John Smith Road, one mile east of Fairview Road. This 1200 acre facility is utilized by FMC-DTL for loading, assembly and testing munitions for the United States Army, Navy and Air Force.

The testing requires the intentional static detonation of munitions which is limited by the approved San Benito County use permit to 150 pounds of TNT. The noise that can be expected from these test firings can be catagorized with the minor noise sources given on page 15. It is intermittent and of very short duration and tends to be a distraction rather than a hazard or an annoyance. Test items fired vary in size. A major percentage of them are small in size and cannot be heard beyond the perimeter of the test site.

The majority of the explosive test firings are conducted in the hills on the test site, at approximately 2 miles due east of Fairview Road. Information obtained from test firing data obtained by the Explosive Research Group of the University of Utah, Salt Lake City, Utah (1), indicates that a noise intensity for the maximum size test

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(1) Calculated from data contained in "Measurements of Air and Ground Shock Disturbances Arising from Demolition Activities" at Umatilla Ordnance Depot, Report No. 7, by Explosives Research Group, Institute for the Study of Rate Processes, University of Utah, Salt Lake City.

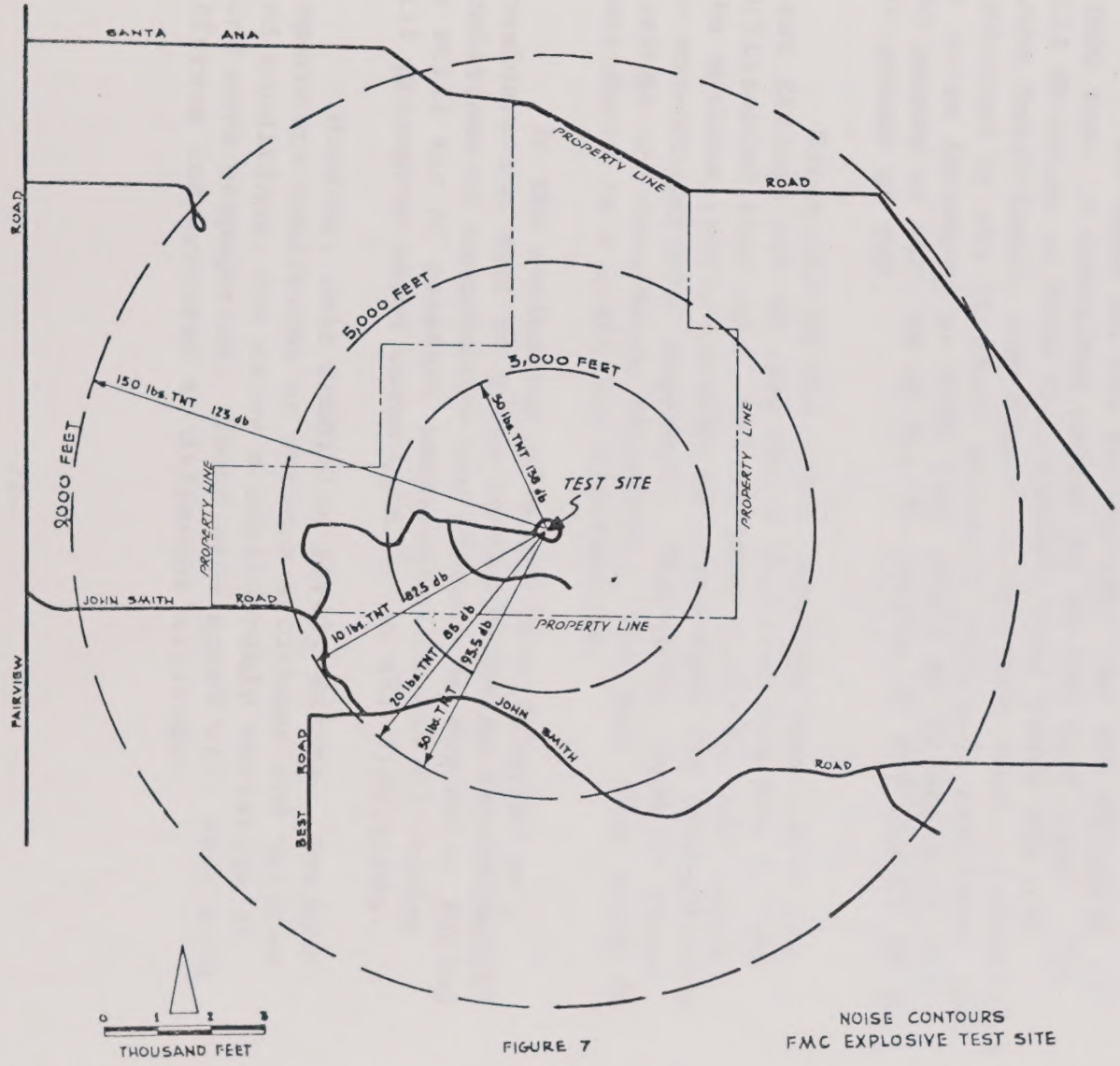


FIGURE 7

NOISE CONTOURS
FMC EXPLOSIVE TEST SITE

firing permissible, (150 pounds of TNT), would be 138 decibels (db) at 3000 feet for 24 milliseconds, and 123 for 60 milliseconds at 9000 feet from the firing point.

As shown on the facing map, the 138 db noise at 3000 feet is contained primarily on the test site. The 123 db noise at 9000 feet extends over Santa Ana and John Smith Roads, and almost to Fairview Road. Information obtained by the Stanford Research Institute indicates that a noise intensity at 5000 feet would be 93 decibels for 50 pounds of TNT, 85 db for 20 pounds of TNT and 83 db for 10 pounds of TNT.

Since all of the noise impulses from explosive test firings are of very short duration and are in the millisecond time span, all of them would be well below the maximum levels considered acceptable for occupational or non-occupational exposure. Therefore, none of these firings are considered hazardous. The most they could be considered is a startling distraction.

In the evaluation of sound wave propagation, consideration must be given to the existing meterological conditions of temperature and winds. An explosive firing in still air of constant temperature at all altitudes will propagate sound waves equally in all directions.

However, this condition rarely exists. Various temperature conditions at various altitudes and various wind conditions, can cause a considerable variation in sound wave propagation. Sound wave speed will vary with different temperatures at different altitudes.

There are several variations of this phenomena, but all of them tend to cause a focusing of the sound waves in a narrow band, some distance from the detonation. This condition is especially prevalent if there is a temperature inversion. This phenomenon is amplified by the wind. Sound waves tend to be pushed in the direction the wind is blowing. This will tend to cause an added focusing of the sound waves.

Thus, the noise from tests fired at the FMC-DTL test site, may at times appear to be louder at some locations on some tests, if a temperature inversion exists, or a strong wind is blowing. Since the prevailing wind blows from northwest to southeast, this would tend to focus the noise in the Santa Ana Valley.

Another matter to be considered, is that sound reception tends to be subjective. In our modern, mechanized way of life, people tend to become acclimated to sounds of all types and often identify with sounds they are constantly associated with. For example, truck drivers identify with truck noise, horsemen with horse noise, pilots with aircraft noise, farmers with farm equipment noise, and factory workers with factory noises.

Thus, strange sounds which they cannot identify, may startle them. Often they will try to identify these sounds and may err in their identification. For example, frequently jet aircraft break the sound barrier over San Benito County; very often these sounds are erroneously identified as FMC-DTL test firings. However, this is done in error because the source of the sound cannot be identified.

Conclusion. Hollister Airport should be protected for future needed expansion by proper zoning to eliminate the possibility of encroaching residential and incompatible uses such as schools.

Noise is becoming an increasingly adverse environmental factor. In adopting zoning regulations to implement the General Plan, performance standards limiting the volume and duration of off-premise noise should be established. The time of day should be a consideration in the regulation of noise.

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